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Introduction

On 30th June, 1967 a request was received from Indian Institute of Public Administration to assist in an enquiry on utilisation of findings of medical research in India. The suggestion was very welcome as I have been toying with this idea for the last six months and have already undertaken a preliminary investigation on the utilisation of action oriented research work in India. The request therefore, provided further opportunity to investigate managerial aspect of the problem which exercise vital influence on the utilisation of the research findings for benefit to the community.

According to the schedule of the Indian Institute of Public Administration the investigation has to be completed within a period of one month from 1st July to 31st July. Considering the amount of research work that is being done in India as discussed elsewhere it is felt that the time limit imposed is not conducive to a detailed enquiry. The exigency of the situation however, requires that a diagnostic study may be made in this direction as no data is available so far with respect to the utilisation of findings of medical research in India.

A preliminary discussion with the Director of Indian Institute of Public Administration, Shri Ved Prakash and Shri Atthreya helped in framing the overall design of this study.

Acknowledgement

It would not have been possible to accomplish the work of this study but for the willingness of the directors of the various institutes, heads of the departments and principal research investigators who have been able to find time to provide information as submitted in this report.

Our thanks are particularly due to Col. B.L. Taneja, Director General, Indian Council of Medical Research, Dr. C. Gopalan, Director, Nutrition Research Laboratories, Hyderabad, Col. B.L. Raina, Director, Central Family Planning Institute who have provided all assistance in compiling the data for this study. Dr. (Mrs.) Amla Rama Rao of the Department of Social and Preventive Medicine has made significant contribution by assisting in the research design, interviews and compilation of data.

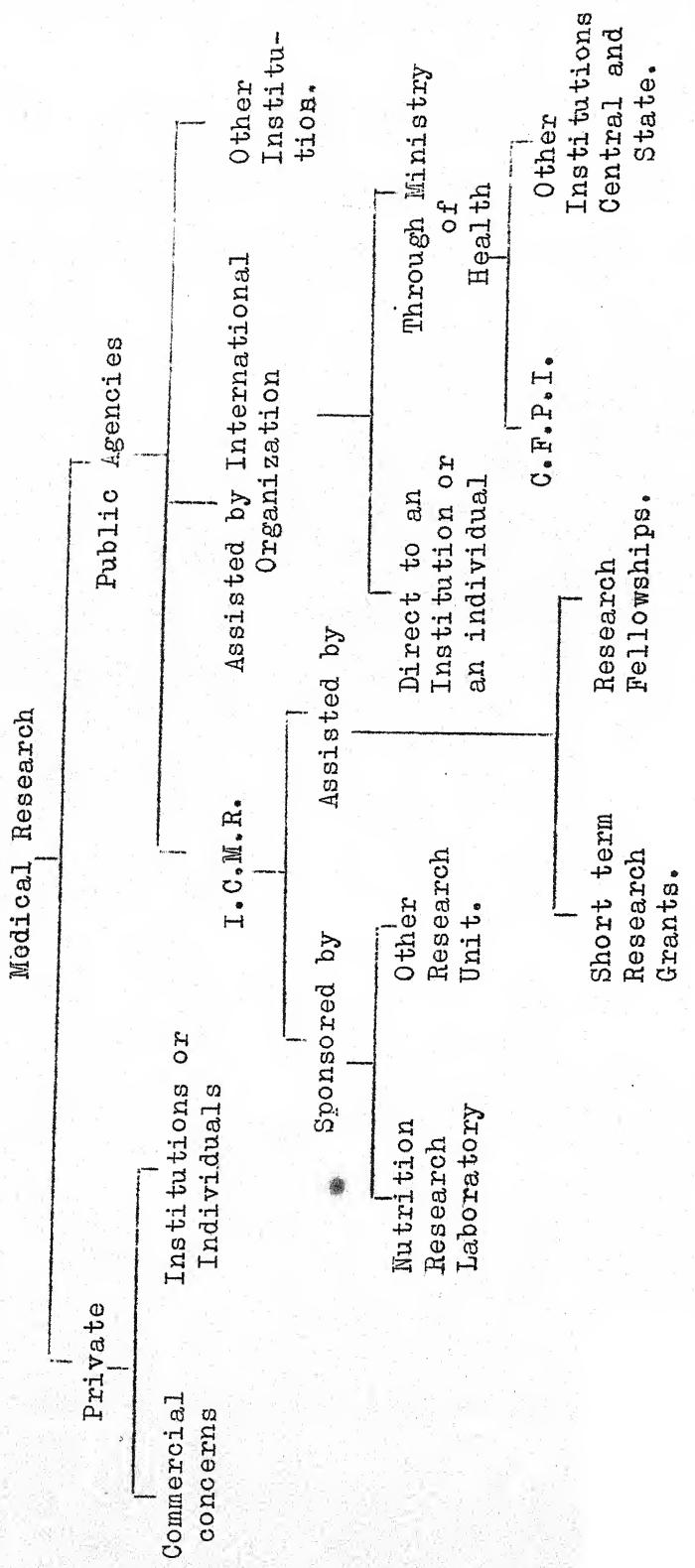
The staff of the research project comprising of Miss J.U. Chand, Research Investigator, Miss H.K. Pandhawa, Stenographer and Mr. J.R. Saini, Clerk deserve a special mention for their conscientious devotion to duties extending beyond the scheduled hours of work to complete the task according to schedule.

Many thanks are also due to Dr. (Miss) M. Chaudhuri, Principal, Lady Hardinge Medical College for having permitted me to undertake this work on behalf of the Indian Institute of Public Administration.

31st July, 1967
Lady Hardinge Medical College
New Delhi

Dr. D. Anand
Professor
Department of Social
and Preventive Medicine

PATTERN OF FINANCIAL AID FOR MEDICAL RESEARCH IN INDIA



Diagnostic Study on Utilisation
of Medical Research in India

1. Definition

At the outset it will be desirable to define the term medical research as is covered in this enquiry.

For purposes of this report the term medical research may be defined as investigation conducted to increase knowledge on medical and allied subjects. By usage the term medical includes research related to mental, physical and social aspects of health and disease.

The term research has been used to indicate all types of studies which are sometimes referred as basic, applied or field investigations.

The definition as stated above enlarges the scope of enquiry to cover research related to problems such as family planning and demography which are not covered by the conventional definition of medical subjects or sciences.

2. Financing of Medical Research

Medical research according to Bhore Committee (1944) and Health Survey and Planning Committee report (1961) is still in developing phase in India but even then it extends over a very wide range of institutes financed through public or private sectors (chart 1).

As will be seen in the public sector the major research contribution of funds to the medical is made by the grants of the

Ministry of Health and Family Planning through Indian Council of Medical Research.

An important contribution to medical research is through academic institutions supported by the State or the Central Governments. These include medical colleges and other allied institutes or departments, like the Department of Botany in an institute may indicate the qualities of certain herbs or plants regarding their utilisation in medicine.

In the private sector most of the research work is sponsored by pharmaceutical concerns both in the nature of fundamental and applied research with a view to improve upon the quality of their products as well as find new drugs. It will thus be seen that Indian Council of Medical Research is the main supporter of research projects in the public sector which is in keeping with one of its major objectives, i.e. to aid, initiate, develop and coordinate scientific research in India.

Approach to the Investigation

Considering the limited time available for this enquiry an attempt has been made to select a sample for intensive study. The time is too short to make a broad based survey covering the entire range of medical research as indicated earlier. The following are the limitation imposed on this study:

1. For purposes of this report the sample studied is mostly out of studies sponsored by ICMR and completed during the period 1962-64.

2. Furthermore only those studies have been considered in the sample which have either been carried out by institutes in the Union Territory of Delhi or Nutrition Research Institute at Hyderabad.

A list of the total studies financed out of ICMR grants during the period of 1962-64 was prepared to select the sample size (Table 1). The following criteria have guided in finalising the sample:

- a) study should have been a continuous one lasting for more than one year and conducted all through the period of observation,
- b) studies selected to include both basic as well as applied research.

Preference has been given to those studies where principal investigators are still continuing work or at least available for discussion regarding the findings and their utilisation.

There is a difference in the approach to enquiry conducted in the Union Territory of Delhi and at NRL, Hyderabad. The main differences in the two enquiries have led to separate reports on research work in Delhi (Part I) and at Hyderabad (Part II) as covered in the following pages. This difference is natural due to two different units of observation. But the findings from both the studies have been discussed jointly under various heads as reported in the chapter on discussion.

Part I

Research in the Union Territory of Delhi

The research studies under review in this chapter are out of those conducted by various institutes in the Union Territory of Delhi. These are financed out of the ad hoc grants from ICMR on year to year basis. The selection of a research proposal depends upon its approval by the Technical Advisory Committee of ICMR in the related speciality and the extent to which the proposal fits in with the overall plans for investigation as outlined by ICMR in their five year plans.

Methodology of Work

As already indicated principal investigators have been interviewed through a semi-structured questionnaire (appendix ii). The questions have been asked on the specific research problem included in the sample, and their views on the practical utilisation of the research findings of the project. The study is not intended to judge the quality of work or the methodology of research. The difficulties experienced by the researchers in the application and utilisation of the research have been recorded.

Before interviewing the respondents the basic findings and reports of each study have been carefully looked into by consulting the records in the office of the ICMR. This has been done to reduce the total time of the interview and to get acquainted with the project before interviewing the investigator.

The total time spent on each interview has not been more than 30 minutes.

Findings

The present findings are based on the information collected from studies conducted in the Union Territory of Delhi during the years 1961-65. Perhaps, a word may be in place to indicate the reason for selecting this particular period for study. It has been assumed that the period denotes a time, during which if any recommendations have ^{been} made, it will be possible to get an idea of the extent of their utilisation. Also, it is not in such distant past that it might be difficult to lay hand on the records or interview the principal investigators.

Universe

In 1961-62, thirty projects were financed by the ICMR in Delhi, out of which thirteen fell in the sample. In the year 1962-63 the number has risen to thirty-eight projects out of which twelve have been selected. In 1963-64, ICMR supported forty-five projects, out of which eleven have been covered in this study. In 1964-65, fifty-one projects have been taken up in Delhi and ten of them have been studied. (Table 1)

TABLE I

Indian Council of Medical Research Projects
in Union Territory of Delhi 1961-65

FINANCIAL YEARS	UNION TERRITORY OF DELHI		SAMPLE		PERCENTAGE	
	No.	Budget	No.	Budget	No.	Budget
1961-62	30	561,070	13	332,255	43.33	59.22
1962-63	38	702,305	12	354,930	31.58	50.54
1963-64	45	785,048	II	225,133	24.44	28.68
1964-65	51	862,880	10	227,380	19.61	27.51
Total:	I64	2,911,303	46	I,149,698	28.05	39.49

The diminishing size of the sample in course of time
is due to emphasis on studies which have continued during the
period of observation.

The discrepancy in the total aggregate of 46 studies as
given in table I and 20 mentioned in the sample size is due to the
fact that studies continued through the period of observation are
counted as one study and not considered as a fresh study for every
year under report.

Basic Data

Seventeen principal investigators have sponsored 20 studies under review thereby indicating that 3 investigators have carried out more than one study at the same time. Eight investigators have not been interviewed for various reasons, e.g. lack of time, on leave or visiting foreign countries. The present report therefore, covers eleven studies, the information for which has been supplied by 9 investigators.

Even out of these 11 studies, it has not been possible to interview all the principal investigators as some of them were out of station at the time of interview. In such cases, their associates have been interviewed to provide the necessary information.

Current Status of the Research Projects

Out of the 11 studies, 9 have been completed. Two studies are under review thereby indicating that 3 investigators studies have continued beyond the period under reference.

have carried out more than one study at the same time. Eight Selection of the Project

investigators have not been interviewed for various reasons,

In all studies under review, the investigators e.g. lack of time, on leave or visiting foreign countries. The themselves have chosen to work on their respective problem of present report therefore, covers eleven studies, the information interest. Mostly the reasons for choice revolved round study of for which has been supplied by 9 investigators.

a problem on which enough data are not available with respect to Even out of these 11 studies, it has not been possible Indian conditions. Most of the investigators when submitting to interview all the principal investigators as some of them were the proposal have attempted to keep the applied aspects of their out of station at the time of interview. In such cases, their findings in consideration. For example, one of the studies aimed associates have been interviewed to provide the necessary information.

at reducing the incidence of disease amongst patients attending a newly established ward in a hospital.

Only two studies at the time when they have been sponsored had identical projects running in different parts of India. But during the course of work, two more projects of similar nature have been taken outside the Union Territory of Delhi.

Exchange of Information

All investigators have stated that they are in touch with persons doing identical work in India or abroad.

They also keep ICMR posted with the progress of their research through the periodical reports desired by that organisation.

The final report of eight projects has already been completed and sent to ICMR. Two are still continuing their study and one is in the process of analysing the data.

Recommendations

For purposes of description the recommendations made by the investigators have been classified under four groups so as to cover modification of existing knowledge, improvement in therapy, change in administrative policy or further research. The recommendations in relation to each group giving multiple

responses are given below:

TABLE II

No. of respondents

N=11

1. Modification of existing knowledge	3
2. Improvement in therapy	11
3. Reforms in administrative practice	3
4. Further research	11

It will thus be seen that most of the findings are applied in nature with a clinical bias as they are meant to bring about a change in the therapy. The saying that a research always leads to further research appears to be confirmed by the suggestions made by each investigator.

Modification of the existing knowledge as compared to available in other countries can provide vital information on the etiology of disease as can be seen from work on sensitivity to wheat in malabsorption syndrome which is not true for the type of cases seen in this country. It is due to malnutrition and protein deficiency that cases suffer from this disease in India. Similarly, arthrosclerotic pattern in Indian population is of different type than what is seen in western countries.

Three projects have recommended administrative reforms like the study on staphylococcal infection in new born recommending that visitors should not be allowed to visit the wards.

Suggestions for Scope and Extent of Utilisation

The research findings on a hypothetical plane may be assumed to be utilized in any one of the five fields discussed below (table III).

TABLE III

Suggestions for Utilisation of Research Findings

N=11

Suggestions for utilisation	Mode of utilisation	Already utilised
Training purpose	11	11
New knowledge	11	11
Clinical trials	5	4
Diagnostic purpose	3	-
Preventive measure	3	3

The mode of utilisation lays emphasis on addition to the knowledge or for purposes of training. The recommendations have also been utilised to the maximum in these fields which may be due to the fact that almost all principal investigators are heads of their respective departments or institutions and as such responsible for both training and research.

The utilisation of the research in other fields like improvement in diagnosis or clinical trial of the new method or

drug, or use for prevention is limited to a small number of projects under review. It is interesting to note that three projects (namely study nos:1,3 and 19 appendix i) have suggested utilisation through improvement of the diagnostic procedures. But according to the information of the respondents this was still awaiting utilisation as a general routine. Some of the findings which have already been utilised in various parts of India according to the information gathered from researches include:

- i) Vellore and Bombay have modified their new born care practices based on identical data as obtained in study no.18,
- ii) The treatment of sub-clinical T.B. cases with INH therapy in all T.B. clinics (study no.5),
- iii) Change in therapy of cases of malabsorption syndrome (study no.1).

Two of the studies conducted by National Institute of Communicable Diseases have been planned to focus attention on preventive measures and their findings have been implemented through the National Health Programme.

Part II

Nutrition Research Laboratory - Hyderabad

Background - Institute

Nutrition Research Laboratory has been functioning as India's premier research laboratory on problems of nutrition since 1950. Previous to that the laboratory was functioning at Conoor where pioneering work in nutrition research has been carried out by now internationally famed persons like Arkroyd, MacCarrison, Fatwardhan. The laboratory is financed entirely by the funds of Indian Council of Medical Research.

The visit to the Nutrition Research Laboratory was planned in consultation with the Director of the Institute, Dr. C. Gopalan for 22nd July, 1967. He was kind enough to send the annual reports of the N.R.L. in advance which gave an opportunity to get acquainted with the type of work being carried out at N.R.L. A group of studies related to problems of anaemia, protein malnutrition and nutritional value of food stuffs were tentatively selected out of the work done in 1962-64 according to the pattern already employed in the investigations carried out in the Union Territory of Delhi.

Delination of the Problems

A preliminary discussion held with Dr. Balsubramaniam, indicated that the procedure followed at Delhi could not be adopted at Hyderabad.

The research work carried out at NRL cannot be reviewed like individual research project. The research forms a major part of the functioning of an Institute which is built in each aspect of the institute's activity. The study therefore, had to cover the research being done in the Institute as a whole. Out of this work, certain examples of completed research have been picked up to illustrate the process of utilisation of medical research as discussed in the body of the report.

The report on NRL also differs from the one in Part I as it does not cover any specific period for review. Instead problems under investigations have been picked up to illustrate the mechanism for utilisation of research as developed at the NRL.

The report is based on the depth interviews carried out with the following:

- I. Dr. C. Gopalan, Director
2. Dr. S.C. Srikantia, M.B.B.S., D.Sc.
3. Dr. S.C. Balsubramaniam
4. Mr. V. Nagrajan, M.Sc.

Working of the Nutrition Research Laboratory

Nutrition Research Laboratory carries out its functions through ten main divisions as indicated below:

- I. Clinical
2. Endocrinology and Metabolic diseases
3. Haematology
4. Biochemistry
5. Analytical Chemistry
6. Physiology
7. Biophysics
8. Pathology
9. Field studies
10. Extension and Training and Dietetics

The organisation of various divisions speciality-wise does not lead to research in water tight compartments related to each speciality. On the other hand, the work carried out by each division is mostly problem centered. The efforts are therefore, made by the division heads to see the type of research they can undertake on a specific problem. For example, in a problem of anaemia the study may be simultaneously taken up by divisions of Endocrinology and Metabolic diseases, Haematology, Biochemistry and Pathology.

The advantage of this procedure lies in the development of an on running system which provides an opportunity to investigate a problem in all its totality and the possibility of immediate feed back of the data to other divisions. In the long run, this procedure is likely to help in developing a broad understanding of the problem under investigation and hence provide greater opportunity for effective utilisation of research findings.

In the words of Assistant Director the working of Nutrition Research Laboratory according to tradition and present policy leans heavily on applied research. This leads to the consideration of such topics for major research as constitute a problem in nutrition any where in India.

The following policy decisions which are observed in day to day working of the Institute also help in the utilisation of research:

- i) publication of the annual reports in time so as to highlight the important investigations and the results obtained during the year under report,
- ii) publication of a scientific journal for the lay public so as to provide them with newer knowledge on applied nutrition,
- iii) specific recommendations of a problem to the State and Central Governments for further action on a matter under study,
- iv) once a week seminar of all staff members to discuss the newer findings out of the work done by any one division.

While visiting Hyderabad I had opportunity to be present in one such seminars on Saturday the 22nd July afternoon which was organised to discuss the findings of a survey of health problems in pre-school children covering 3,000 subjects completed during the last one year.

The advantage of such a method is obvious as each section is able to get an idea of the work done by other divisions and visualise it from their own angles.

The speed with which the research findings can be applied for the benefit of the community will mostly depend upon the facilities available for the research laboratory to keep in touch with the community problem.

Keeping this in view the NRL has made an attempt to extend the scope of investigation and carry out the benefits of the research to the people by offering following services:

I. Training

NRL as the name suggests started purely as an Institute for research. But with the accumulation of research findings, it was considered desirable to promote utilisation of research by providing training opportunities for the health staff from various states in India.

The 'request training' programme which were started about fifteen years have now been replaced by 'regular training programme', organised once a year for a period of 3 months meant for senior technical staff from medical colleges and health departments.

In addition the NRL has also runs short seminars on specific problems, e.g., nutrition and anaemia, hormones and anaemia or summer institute. It is now proposed to start a full fledged diploma course in nutrition.

The NRL with its accumulated work in various aspects of nutritional research and multidisciplinary staff actively engaged in the programme feel that they talk from a position of strength when teaching about nutrition. The material collected through research both in the laboratory and the field provides most effective audio-visual aids to teach applied nutrition.

All these training courses are meant to provide better understanding of nutritional problems or of methods to investigate them. For example a pediatrician from one of the medical colleges was interested in learning certain techniques for which he was given the necessary facilities.

2. Collaboration with other Institutions

National Research Laboratory has organised a nutrition clinic and has also been allotted beds in the Nilofer Hospital. The purpose of this clinic is to provide an opportunity for the senior doctors to identify the clinical picture of nutrition deficiency cases visiting the Nilofer Hospital. This helps in utilising the existing knowledge for early diagnosis, treatment and prevention.

Opportunities were also taken to develop work hypothesis based on the initial research carried out at the NRL.

Efforts of such collaboration has paid rich dividends through identification of problem such as Pallagra. It has also provided an opportunity to NRL for further investigation on pathogenesis of the disease and finally to make recommendations which if implemented can help to prevent pallagra. The details of this particular problem are presented in case studies number 2.

Equally important contribution has been made through dissemination of knowledge to the clinical staff of the medical colleges and thereby sensitise them to the various nutritional problems on which work has been carried out at the NRL.

As a long term goal such a routine is expected to provide better understanding of the nutritional problems to the clinical staff thereby leading to better appreciation of the problems of nutrition by the medical students.

3. Collaboration with Indian Council of Agriculture Research

Judging from the ~~lentil~~ sequential progress of the research findings one can see the co-relation between identification of nutritional disease in an individual, completion of investigations to find the natural history of the disease with final focus on consumption of cereals which may either precipitate ^{the} disease or perpetuate it. The role of Jowar and Lathyrus sativus as incriminating cereals which precipitate or perpetuate the disease conditions has already been established through the work done at the NRL.

The logical sequence of these investigations therefore extends the work to an investigation of the quality of cereals so as to identify their nutritional value or toxic properties.

Such a work requires active collaboration of Indian Council of Agriculture Research. This has been achieved through the establishment of a unit of Indian Council of Agriculture Research on the premises of NRL. It has helped in carrying out jointly basic research on screening the quality of the cereals of various strains as discussed in case studies I and 2 and continue research on genetic control of the toxin in cereals.

4. Rural Practice Field

The ultimate object of research in the field of nutrition is to provide better knowledge and thereby help in improvement of nutritional status in the community. With this objects in view the NRL has established rural practice field in collaboration with the staff drawn from the department of health and the department of agriculture.

Briefly stated the purpose of this ~~training~~ course is to provide technical break through in the application of the research findings obtainable from work in the laboratory. It is only after the intial field trials that recommendations are made to the State and Central Govts. regarding the suitability of the particular method in solving nutritional problem. It will thus be seen that the process of utilisation of research follows a spiral trend in its movement as indicated in fig. (i).

The Process of Utilisation - a Review

The present study covers two different systems of work for carrying out medical research in India:

- i) ad hoc research grants made to an individual researcher through the institution where he is working and
- ii) continuous pattern for research built in the functioning of the institute (NRL).

The study, with all its limitations, provides certain interesting pointers for utilisation of medical research being carried out in the two systems under study. To what extent this picture is representative of Indian conditions is a matter of conjecture. But it does help to highlight the process for utilisation of research in the two systems, which may be applicable to conditions elsewhere in India.

The term utilisation has been used for the purposes of this report to indicate the process of dissemination and the extent to which the findings have been put into application as evidenced from the records or from the data collected through personal interviews.

The following discussion based on the findings of the Part I and II of this study is meant to identify factors which have helped in the process of utilisation as also those which have not.

1. Channel of Communication

The first stage of utilisation will involve communication of research findings from the laboratory or area of work to the individual, institution or agency likely to utilise these findings. The procedure common to both the studies include:

- i) Publication of findings in professional journals,
- ii) Technical reports on specific problems,
- iii) Correspondence with individual worker.

Most of the research work carried out by various researchers is published in the professional journals, in India and abroad. The Indian Journal of Medical Research is one of the publications financed out of the grants of ICMR and mostly publishes the work carried out on ICMR sponsored studies. The paper as the name suggests, is mainly meant for a researcher, or ^{teacher} ~~teaching~~ in medical colleges who naturally are likely to have an academic interest in the research findings.

The Indian Council of Medical Research has brought out a series of technical reports on a number of topics, e.g. infective hepatitis, lathyrism etc. which are based on the findings of a number of workers engaged on the sample problem. This in a way highlights the contribution made by ad hoc projects in providing findings that have already been accepted in some of the national programmes. For example, the work on prevention of goitre,

treatment of T.B. with INH or now the use of vaccine in the control of trachoma have developed out of such work in various parts of India. These reports carry certain recommendations either for further investigation or for utilisation of the findings. The reports are circulated as a matter of routine to all the state health departments^{and}, medical colleges and are catalogued for supply to any individual worker on demand. But the work in these ad hoc research projects covers variety of problems all of which may not constitute a major health problem in India. For example, the study number 18 as demonstrated a very simple way to check staphylococcal infection amongst the new born. It is now for the country to utilise the findings. It is possible that in the priority list of reports to be published such a finding may get lost as it is a work carried out in one of the small projects only.

Role of Scientific Advisory Committee

The other major source for dissemination of information is the Scientific Advisory and Technical Committee of ICMR. Through their annual meetings these committees serve as a very important source for assessment and exchange of views on the work accomplished. This in itself is likely to induce others interested in the work or /the problem, to take it up for further study. Briefly stated such committees help in geometric progression of scientific knowledge.

On the other hand these committees mostly consist of experts drawn from academic fields. The State Medical Officers (Directors of Health Services) as a matter of routine do not attend these meetings. An opportunity thus is missed for utilizing these meetings as an occasion for translating newer scientific knowledge in administrative practices.

All new scientific knowledge if it has to benefit the community must get translated into administrative practices which will equip the staff to carry out their functions more effectively. This is possible only when there is some occasion for the administrative officers (Directors of Health Services) and the scientists or researchers to sit across the table and devise methodology to help implement the findings through appropriate administrative mechanism. It is also possible to screen at this stage the procedures so as to differentiate between those:-

- i) that do not require any extra expenditure and therefore can be put into practice immediately,
- ii) that require extra expenditure and will have to be considered in terms of state resources.

In the former group falls the finding of the study number 3 which in application will require a shift in the emphasis on nutrition education for prevention of athero-sclerotic changes. In the later group will come the findings of study

I3 which has demonstrated the utility of plastic values but is not immediately applicable for benefit of the needy population in India as these plastic values are not manufactured in India.

The Table no. I gives an idea of the steady rise in the expenditure on adhoc project in ^{the} Union Territory of Delhi. This is true for such expenditure in the rest of the country. Considering the rapid increase in the number of such projects it is doubtful if the Scientific Advisory Committee can accomplish the task of screening all the studies during the short period for which they meet. The committees are functioning with a heavy agenda as seen from the comments in the Health Survey and Development Committee report which mentions that there is "the dearth of experts competent to examine and comment on the various schemes. It has also been the experience that too many schemes have had to be screened in too little time by the Advisory Committees and the Scientific Advisory Board . The transformation of the recommendations and findings to the administrative practice is vital for deriving maximum benefits from the research findings. It is doubtful if such a work can be handled on whole time basis by the Scientific Advisory Committee. There appears therefore a need to develop a way of working so as to continuously transform the research findings in administrative practices.



System for feed back

This task could be achieved by creating a cell in the ICMR of administrative medicine or feeding the findings of the various research projects to NIHAE which inturn may convert the findings into administrative practices and use the data in the staff college.

The recommendations that need extra expenditure may be discussed in the meetings of the Central Council of Health or Conference of State Administrative Medical Officers. (Fig.2).

These suggestions are based on the assumption that government as the largest consumer of the scientific advances in medicine, must establish a procedure for diffusion of ideas from the scientific world to administrative channels.

The suggestions as stated above may not require any major reshuffle in the existing set up but only a slight shift in the procedures. It is possible that the administrative officers may have some other suggestions for establishing a work pattern which will continuously feed back the administrative organization of Central and State Governments.

Cone of Influence

By recommending the above measures, it is not suggested that research is not being utilized through modification of administrative procedures. A review of the extent to which

research is able to influence, termed as cone of influence, will be helpful at this stage.

Most of the researchers have indicated that they have put the findings into practice, particularly for training or for advancing the knowledge for further research. The utilization of these findings whether it relates to discarding the cord dressing or procedure for easy diagnosis of a case of pellagra is mostly limited to the institution where work has been carried out or a geographical area where there is free exchange for discussion and demonstration amongst the technical staff. The latter is more true of NRL where staff has more facilities and resources to carry out such work. The only exception to this routine are the findings from those projects which have been processed by ICMR to feed the national programme and are discussed elsewhere.

The existing lacunae in the transmission of knowledge particularly with respect to its application to improve the health and services, needs to be probed further to devise ways for extending the cone of influence.

Peoples' acceptance

The development of a scientific advancement does not necessarily lead to a technical know how on the approach for making the people accept and demand the benefits from the newer knowledge. The classical example in our country is the availability of scientific knowledge on prevention of small-pox and its prevalence in the country. If this aspect has to be taken into consideration then the research findings will have to be again viewed from two different aspects:

- (i) where the findings are meant to feed only the researcher or professional workers in a hospital and
- (ii) where the findings are intended to benefit the community at large.

Acceptance to the newer line of treatment in T.B. programmes involving acceptance for the use of processed are Keshari dal/two examples in this direction. To some extent NRL has such facilities. But on the whole the evidence so far is lacking on any extensive use being made of experts in behavioural sciences and public health administration to help in developing ways for greater acceptance by the people of the newer advances in health and medicine.

Follow-up

Many of the problems as discussed earlier can form a part of the "follow-up" work carried out by a whole time unit. But this unit if established will contribute very significantly toward more effective utilization of research findings. It will also keep the researchers posted with the work being done so that they do not have to state that "I am using the findings but I do not know how they are being used else where".

In some instances, there is evidence of the other extreme in follow up procedures. This includes a follow up of the applied findings to more basic work like genetic control of toxin in cereals by working in close collaboration with researchers from other specialities or a follow up in the field to find peoples' acceptance.

The evidence as discussed so far has helped to indicate that research findings on health problems like disease process are multi-dimensional. The researcher, the public health worker and the behavioural scientist have to coordinate their efforts to deal with all aspects of the problem and to devise plans, programmes and procedures which are put together as an operating whole for the maximum utilization of the research findings.

The work done so far provides some evidence that in certain projects this concept has been used for maximising the utility of research findings. This is a good augury and needs to be further investigated in all its aspects to devise new concepts and models that will help to achieve better utilization of research findings in all their multi-dimensionality.

Summary and Recommendations

The study has been carried out in two geographic areas, Delhi and Hyderabad and covers two systems of medical research. The findings of eleven studies in Delhi and two studies from NRL Hyderabad have been used to provide material for this study.

The process of utilisation of research from the laboratory to the community has been studied.

RECOMMENDATION

At the risk of the repetition it needs to be remembered that the present study covers only a small microcosm of the various units responsible for carrying out medical research in India. The study is particularly lacking in the field of family planning and demography which are the other two important fields of research concerned with the vital problem of population control.

Even then an attempt has been made to make broad generalisations based on the findings of this study.

1. Utilisation of Research Findings

- i) Most of the work under review is applied in nature and hence the utilisation of the research findings is built in the research plan,
- ii) The findings are utilised mostly in the areas where they have been developed as it is the areas under the direct influence of the research investigators.

Recommendation

There is a need to make a detailed study of the procedures that will help in the application of the findings over a wider area covering a broader range.

II. Research Findings and National Health Programmes

Some of the findings of the ad hoc studies or NRL have been used for developing the national health programmes. This appears to be more effective in studies which are initially planned to answer some of the problems met in the national health programmes.

Recommendation

Ad hoc studies have already made a significant contribution in strengthening some of the national health programmes like, malaria, tuberculosis or goitre control. The findings appear to be most readily utilised when research is taken on specific applied aspects of a national health problem.

III. The Nature of Utilisation

According to the available information findings are more utilised for purposes of training and further research per se than for any other purpose.

Recommendation

The difficulties met in augmenting research findings for bringing about a change in the administrative practice or utilisation by the people need to be further looked into. This would be achieved through better follow-up of the recommendations based on the research findings.

IV Follow-up

From the point of administrative procedures the follow-up is found lacking in most of the studies except a few which have the advantage of such support from the work pattern in the institution itself. The bottleneck needs to be removed through careful scrutiny of the type of job to be handled for follow-up.

Recommendation

- i) On a trial basis a follow-up unit may either be established in ICMR or made a part of the working of NIHAE so as to undertake screening and transformation of newer scientific knowledge in administrative practices,
- ii) A systematic review may be made at least once a year of the research findings which can be implemented with additional financial expenditure. This may be carried out at the highest level like Central Council of Health or in the meeting of the administrative state medical officers.

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V Further Investigation

The present study provides some opportunities to get an insight into certain aspects of the process of utilisation of medical research. The investigation has been primarily oriented to cover researchers. In order to obtain a broader picture of the utilisation it will be desirable to carry out further investigations from the point of view of the consumer.

If this view is accepted than such a study will have to cover at least four view points:

- a) utilisation of medical research from the point of view of commercial use,
- b) utilisation of research for purposes of training and further research,
- c) utilisation of research from the point of view of administrators or a district, state and Central Health Directorate,
- d) utilisation to the extent it is possible from the point of view of MAN - the ultimate consumer of modern research.

Appendix i

LIST OF STUDIES SELECTED

- I. Study of incidence and pathogenesis of malabsorption syndrome in diarrhoeas of non-specific origin under Dr. V. Ramalingaswamy at the All India Institute of Medical Sciences, New Delhi
2. Clinico-epidemiological survey of trachoma under Dr. I.P. Agarwal and Laboratory investigation of trachoma cases under Dr. Ghosh Ray, at the All India Institute of Medical Sciences, New Delhi.
3. Biochemical and morphological evolution of spontaneous atherosclerosis in man under Dr. V. Ramalingaswami at the All India Institute of Medical Sciences, New Delhi.
4. Studies on strain variations in plasmodia and their impact on the Malaria Eradication Programme under Dr. S.P. Ramakrishnan, Director, Malaria Institute of India, Delhi.
5. Scheme for carrying out the INH treatment as a research-cum-service programme from tuberculosis clinic under Dr. B.K. Si-kand at the T.B. Centre, New Delhi.
6. Studies on a new anti-tubercular antibiotic under Dr. S. Chandrasekhar at the V.P. Chest Institute, Delhi.
7. Studies on growth and physical development of Indian infants and children under Dr. P.C. Biswas at the University of Delhi, Delhi.
8. A follow-up study of the Delhi epidemic of infectious hepatitis under Dr. H.K. Chuttani at the All India Institute of Medical Sciences, New Delhi.
9. Drug Research Unit under Dr. C.L. Malhotra at the Lady Hardinge Medical College, New Delhi.
10. Enquiry on hypothalamic and endocrinial control of physiology of reproduction under Dr. B.K. Anand at the All India Institute of Medical Sciences, New Delhi.
- II. Study of effects of sterilisation in human females and its evaluation by experimental work on female rats under Dr. (Km) L.V. Phatak, New Delhi.

- *I2. Morbidity Survey among C.H.S. beneficiaries under the Director, Contributory Health Service Schemes, Directorate-General of Health Services, New Delhi.
- I3. Enquiry on the surgical correction of mitral insufficiency under Dr. Eric J. Lazaro and Dr. S.B. Roy at the All India Institute of Medical Sciences, New Delhi.
- *I4. Morbidity of peptic ulcers in Delhi with reference to epidemiological, clinical and laboratory investigations under Dr. E.H. Holmes and Dr. K.L. Wig at the All India Institute of Medical Sciences, New Delhi.
- I5. Assessment of the susceptibility of insects of public health importance to insecticides and investigations on other related problems under Dr. S.P. Ramakrishnan, Director, Malaria Institute of India, Delhi.
- *I6. Studies on constituents of the Tuberclle Bacilli responsible for the establishment of disease under Dr. (Mrs) S. Chandrasekhar, Senior Research Officer, Vallabhbhai Patel Chest Institute, Delhi.
- *I7. Studies on (a) industrial neurosis and (b) work shift and optimum rest pause under Dr. H.C. Ganguli, at the Air Headquarters, New Delhi.
- I8. Enquiry on staphylococcal infections in the new born under Dr. P.N. Taneja at the All India Institute of Medical Sciences New Delhi.
- I9. A study on aetiological significance of parental functioning as antecedent to behaviour and personality disturbances in children under Dr. B.D. Bhatia, Director, Child Guidance Clinic, College of Nursing, New Delhi.
- *I20. Morbidity and Mortality Survey in Children in New Delhi.

* Could not be investigated.

Interview Schedule for Principal Investigators

- I. Name of the Principal Investigator _____
2. Project _____

Dr. let me tell you clearly in the first instance that this study aims at findings out the extent and the speed with which the research findings have been utilised. I would also like to know how these findings have been utilised and for what purposes. The study does not intend to judge the quality of work or the methodology of research. Now coming to the specific studies that you have conducted:

- I. Is this study completed or still continuing?

Continuing/Not continuing

2. Did you take this project of your own or where requested by the ICMR to participate in the project?

On my own/Not on my own

3. If you select it yourself what made you to choose the topic?

4. Has this type of work being done anywhere in India:

(a) Before you understood the study Yes _____ No _____

If yes where _____

(b) During the course of investigation Yes _____ No _____

If yes where _____

5. Are you in correspondance with other investigators doing similar type of work?

6. I have/have not seen the report submitted by you to ICMR?

If not, did you send any of them to ICMR?

Can I have a copy of it? Yes _____ No _____

7. Did you publish interim observations and findings in press?

Yes _____ No _____

8. Have you submitted the final report to the ICMR?

Yes) _____ No _____

Date of submission:

9. Did you make any recommendations yourself? Yes _____ No _____

If yes, what?

10. What are the comments of the Expert Committee?

II. In what way the findings of your research be best utilised?

I2. Would you classify your findings as an addition to the newer knowledge; in the related field of medicine?

Yes _____ No _____

I3. What in your opinion is the applied aspect of your findings?

I4. Are you aware if some of your findings have already been put in to practice?

Yes _____ No _____

If yes by whom -

How -

Where -

I5. Did you design any new equipment during your work?

Yes _____ No _____

If yes, What is the potential of its utilisation

- a) in Industry
- b) in Medical field.

I6. What do you think is the best way to utilise these findings?

I7. Have any papers in relation to the study been published?

Yes _____ No _____

If yes -

Topic	Journal	Year
-------	---------	------

1.

2.

3.

4.

I8. Have you received any enquiry from any source regarding your findings?

If yes, from where

- a) India
- b) Abroad

I9. What type of enquiries are there?

India	Abroad
-------	--------

If no - Did you have any administrative problems in publishing your results?

Yes _____ No _____

If yes, what kind:

20. Do you think that your findings have turned out to be such as to suggest further research in the similar field?

Yes _____ No _____

If yes - What kind of research would you recommend?

Has some one shown any interest in doing it?

Yes _____ No _____

If yes - Who -

CASE STUDY - I

(Lathyrism)

Lathyrism is a disease marked by loss of function of lower limbs and is seen in population consuming large quantities of lathyrus sativus or Keshari Dal. In India it is seen mostly in Madhya Pradesh.

The description as per details below covers the major sequence of events, which briefly indicate the chain of research work at NRL that has led to the present stage in utilisation of research for eradication of the problem - lathyrism.

Identification of the Problem

In 1933-34 the disease was first noticed in Madhya Pradesh. The disease had been reported before, in France and Germany. The NRL took up the investigations in year 1935 to find out the etiological factors in the disease process.

Field Investigations

Field investigation showed that people consuming large quantities of lathyrus sativus or Keshari Dal suffered from the same kind of symptoms.

Experimental Work

The sequence of the experimental work each completing the findings of the other is described below and covers the period of 1935 to 1965.

i) Bio-chemical investigations

- a) A considerable retention of manganese which acts as a toxic substance in people eating Keshari Dal was found to be a factor predisposing to the disease process,
- b) Difficulty was experienced due to the lack of identification of toxic substance: In 1964 the first major breakthrough occurred when it was possible to make concentrated toxin for parenteral administrations in chicks. The disease could not be demonstrated in other animals like mice, rats and monkeys,
- c) Nature of toxic substance: The toxin identified is aminoacid (peptide) which is neurotoxic in nature.

ii) Work on the animals

The experimental work done in the NRL on the chicks in 1964 proved that the neurotoxic substances in the Keshari Dal can produce the same type of symptoms

Working Hypothesis for Prevention of Disease

Having identified the toxic substance and demonstrated cause effect relationship through the production of the disease in chicks, the next step in the utilisation of the findings, related to measures for diluting the neuro-toxins. It is based

on the assumption that consumption of Keshari Dal carrying neurotoxin be completely prohibited.

Community Disease for Prevention and Control of Lathyrism

Field investigation for parboiling and steeping of Keshari Dal in hot water to dilute the toxic substances, have been successfully carried out in areas where the disease is endemic (Distt. Rewa - M.P.).

The process has been further improved so as to lead to greater acceptance of the processed Keshari Dal by the people. Recommendations on processing of Keshari Dal to reduce its toxin have already been made to M.P. Government. Arrangements have been made to establish a plant for processing the dal.

Collaborative Research

Further experimental work related to the following is done in collaboration with ICAR and Department of Agriculture, Madhya Pradesh:

- a) Study of the cereals of *Lathyrus* family to genetic control of toxic substance.

By-Products of Experimental Work

During the course of experimental work, a method has been developed for determining the adulteration of other dals with Keshari Dal. This method is fairly sensitive (upto 5 per cent) and has been communicated to the public health analysts in other parts of India.

Documentation

The findings with respect to the development of work in relation to lathyrism have been published without any delay in the annual reports of NRL. Indian Council of Medical Research has also published technical series on the subject. In addition, the specialists in the laboratory have published papers on various aspects of experimental work related to lathyrism.

Appendix iii

CASE STUDY - II

(Pellagra)

Case study II relates to the investigations carried out in relation to the natural history of the disease, Pellagra which was thought to be due to the deficiency of Niacin and manifests itself as either in skin disorders or as mental disorders.

The sequence of investigations as carried out upto date is given below. Some of these studies have been carried out concurrently by different units of NRL, so that to reduce the period of investigations and thereby leading to early utilisation of the research findings.

Identification of the Problem

this
In 1929/disease was identified but/^a few cases were seen in India for a long time before that. Pellagra was mostly seen in maize eating population.

Experimental Work

In 1939 the hypothesis was that the deficiency of nicotinic acid in maize leads to the disease.

Analysis of maize in the laboratory showed that niacin when combined with tryptophan does not allow the niacin to be used by the body.

Further investigations in the field and laboratory brought to light that tryptophan and nicotinic contents of rice is as good as the maize but the rice eating people do not suffer from the disease. These findings led to further experimental work as indicated below.

Transfer of NRL to Hyderabad was a break through the clinical picture, when the staff got an opportunity to work in Nelofer Hospital and found that pellagra cases are seen in outdoor patient department. Many of these cases previously were not diagnosed as cases of pellagra. Since the population was mostly jawar eating in that area, the occurrence of pellagra in population around Hyderabad could not be explained with existing theory.

The work to analyse jawar was taken up in NRL in 1965, to find out the disease precipitating factor of jawar that may be common in maize as well.

This led to the new hypothesis of high leucine contents as an important characteristic of jawar common with other cereals consumed by the population suffering from pellagra.

Clinical Trials

High intake of leucine by dormant cases of pellagra both in the clinic and hospital led to exacerbation of symptoms and more mental disorders. The pups fed on high leucine diet

Appendix iii

were also seen to develop black tongue.

The seasonal variation of the incidence of the disease in January, February and March coincided with the consumption of jawar in the local population.

Collaborative Research

is
Collaborative research/done for analysis of the various strains of jawar with respect to aminoacids contents which may be as high as 16 per cent. The work has therefore, been taken up by screening of various strains of jawar so as to select those strains which will have low leucine value. This is being done by ICAR.

Further investigations will require trials of these strains for the resistance of disease and yield per acre.

Documentation

The evidence collected from the field work, experimental work with animals and man, the laboratory work on jawar and maize about the nicotinic acid contents, all pinpointed to the fact that it is the high content of leucine in jawar that acts as a precipitating factor for endemicity of pellagra, in cases where protein intake is low.

The first technical paper incriminating leucine as an important factor for pellagra was published in 1960.

The NRL in their annual report keeps describing the work at various stages and ICMR in the scientific papers publish the work on pellagra from time to time.

Findings - Their Utilisation and Limitation

The spiral movement of the research as indicated in the body of the report has led to the present findings that high leucine contents of the cereals such as jawar with low protein intake is likely to result in pellagra. In order to apply these findings into practice, particularly in areas where pellagra is endemic, we will have to consider the socio-economic environment which seem to compel the population to subsist on jawar alone.

The other scientific method to reduce the incidence of the disease is the genetic control of the seeds which is also being worked out in collaboration with ICAR.

Appendix iv

DOCUMENTS REFERRED

1. Annual Reports of I.C.M.R.- 1962 - 65.
2. Annual Reports of N.R.L.,- Hyderabad.
3. Files of the Projects under Study.
4. Report of the Health and Survey and Planning Committee, 1959 - 61.
5. I.C.M.R., Technical Report.